UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
1595 Wynkoop Street
Denver, CO 80202-1129
Phone 800-227-8917
www.epa.gov/region8

Ref: EPR-SR

JUL 10 2017

ACTION MEMORANDUM

SUBJECT: Request for Approval of a Time-Critical Removal Action at the Bonita Peak Mining District NPL Site – Gold King Mine Integrated Discharge Controls and a Request for Ceiling Increase and Continued Consistency Exemptions from the $2-million Ceiling and 12-Month Performance Statutory Limits

FROM: Rebecca Thomas
Remedial Project Manager

THRU: Laura Williams
Unit Leader
Emergency Response and Preparedness Program

David A. Ostrander
Program Director
Emergency Response and Preparedness Program

Stan Christensen
Unit B Leader
Superfund Remedial Program

Bill Murray
Program Director
Superfund Remedial and Federal Facilities Program

TO: Betsy Smidinger
Assistant Regional Administrator
Ecosystems, Protection and Remediation

Site ID# CON000802497

I. PURPOSE

The purpose of this Action Memorandum (AM) is to request and document approval of a Time Critical Removal Action (TCRA) described herein for the Gold King Mine Integrated Discharge Controls (Controls) in the Bonita Peak Mining District (BPMD) Superfund Site (Site). This TCRA involves the installation of a flow control structure in the Gold King Mine Level 7 "new" adit, constructing a horizontal drain from the new adit to the Level 7 "old" adit, and constructing an earthen stabilization berm in front of the collapsed portal of the old adit.

Conditions existing at the Site present a threat to public health or welfare or the environment and meet the criteria for initiating a removal action under 40 CFR 300.415(b)(2) of the National Contingency Plan (NCP). The cost ceiling established by January 12, 2017, Action Memorandum for the BPMD – Gladstone Interim Water Treatment Plant is $5,489,000. A cost ceiling increase of $594,000 is needed to implement the additional work proposed for the Integrated Discharge Controls at the Gold King Mine as discussed in this Action Memorandum.

This removal action involves no nationally-significant or precedent-setting issues. This time-critical removal action will not establish any precedent for how future response actions will be taken and will not commit the US Environmental Protection Agency (EPA) to a course of action that could have a significant impact on future responses or resources.

II. SITE CONDITIONS AND BACKGROUND

Site Name:	Bonita Peak Mining District Superfund Site
CERCLIS ID:	CON000802497
Superfund Site ID #:	A8~~E~~ M5
NRC Case Number:	112824
Site Location:	Gladstone, San Juan County, Colorado
Lat/Long:	37.8945/-107.6384
NPL Status:	NPL Final
Category of Removal:	Time-critical
Name of water body:	Cement Creek, Animas River
Contaminant name:	Zinc, cadmium, other mining-related inorganic contaminants
Removal Start Date:	FY 2017/4

A. Site Description

1. Removal site evaluation

The TCRA area is located about 9 miles north of Silverton, Colorado in the BPMD Superfund Site. The TCRA area consists of the Gold King Mine Level 7 new and old adits. On August 5, 2015, while EPA was conducting an investigation of the Gold King Mine adit, 3 million gallons of mine influenced water (MIW) was unexpectedly released from the mine. The MIW first entered the North Fork of Cement Creek, then the main stem of Cement Creek, then the Animas and San Juan Rivers.

After the release, EPA initiated an emergency removal action. As part of this action, the Interim Water Treatment Plant (IWTP) was installed near the old town site of Gladstone. The Gladstone IWTP was operational by October 2015 and removes metals through a lime neutralization, flocculation, and precipitation process.

The listing of the BPMD Site on the National Priorities List (NPL) became effective on October 11, 2016. The Gold King Mine and the IWTP, where EPA currently treats the adit discharge, are within the BPMD Site.

The Gold King Mine is one of numerous underground mining operations in the BPMD Site upstream of Silverton, Colorado in the volcanic terrain of the San Juan Mountains. The district contains some 400 abandoned or inactive mine sites. Much of the area near Silverton, within the Upper Animas River watershed, historically was mined for gold and silver. The Gold King Mine was primarily a gold mine and operated until the 1920s. Multiple portals to other abandoned mines, near the TCRA area, were closed with bulkheads. Some of these actions led to increased flow from the new Level 7 adit of the Gold King Mine.

The Gold King Mine is located along the North Fork of Cement Creek, a tributary to the Upper Animas River. It and many other inactive or abandoned mines in the mining district continue to discharge MIW from adits into streams. The Animas River and many of its tributaries, including Cement Creek, carry elevated concentrations of hazardous substances (heavy metals) due to both MIW (acid rock/acid mine drainage) generated from mining activities and from naturally mineralized sources.

The remedial action objective of the TCRA is to construct an integrated system of controls for management of the MIW flows; thereby minimizing the release of contaminants of potential ecological concern (COPECs) and total suspended solids (TSS) in the Gold King Mine adit discharge to Cement Creek. The surface water COPECs for Cement Creek, determined in a baseline ecological risk assessment (Techlaw 2015), include total aluminum (Al), dissolved beryllium (Be), dissolved cadmium (Cd), dissolved copper (Cu), total iron (Fe), dissolved lead (Pb), dissolved manganese (Mn), dissolved silver (Ag), dissolved zinc (Zn), and pH.

2. Physical location

The Gold King Mine (37.894712°N / 107.638595°W) is located in San Juan County, Colorado, approximately 9 miles north of the town of Silverton (Figure 1). It is located in the southeast quarter of Section 16, Township 42 North, Range 7 West on the U.S. Geological Survey (USGS) Ironton 7.5-Minute Topographic Quadrangle (CDM Smith 2016). The Level 7 portal elevation is 11,438 feet using the North American Vertical Datum of 1988 (NAVD88). Road access is via County Road (CR) 110 from the town of Silverton to the abandoned town site of Gladstone and CR51 north and east to the Gold King Mine. The site lies near the North Fork of Cement Creek (North Fork) on a south-facing mountainside slope with a steep (approximately 60 percent) grade. The mine is accessible during non-snow months of the year, typically late June through early October.

The Gold King Mine Level 7 site consists of a waste rock dump and a discharging adit with two known portals. The west portal is the historic old adit, driven in the late1800s. The east portal is the new adit, driven in the1980s. By the early 2000's, both portals had collapsed and debris blockages impeded flow. In 2009, both adit portals were closed by the Colorado Division of Mining Reclamation and Safety (DRMS, 2009).

In 2015, the population in the community of Silverton was estimated to be 637. Historically, mining was the main industry in the area; therefore, there are many inactive and abandoned mines within the Cement Creek watershed. Tourism (including skiing and recreation) and

construction are now the most common industries. There is a ski area north of Silverton, which is south of the TCRA area. The ski area is limited to a single lift and small parking lot.

The land east of Cement Creek, near the Gladstone IWTP, is divided into several private mining claims, with a small parcel of land adjacent to the IWTP managed by the U.S. Bureau of Land Management (BLM). Much of the land west of Cement Creek is managed by the BLM and is interspersed with a few private mining claims.

The location of the Site has an alpine climate with snowy, cold winters and cool summers. The greatest amount of snowfall is between the months of November and April, with an average snowfall of 12 feet per year (CDM Smith 2016). Precipitation was evaluated by long-term precipitation data collected from the National Oceanic and Atmospheric Administration (NOAA) weather station at Silverton, CO, which is in close proximity to the TCRA area. The weather station has a latitude of 37.809 N and a longitude of 107.663 W. In 2015, the Silverton station recorded annual precipitation of approximately 26 inches (NOAA 2016). In this alpine climate region, the minimum and maximum mean temperatures for January and July are 8°F/24°F and 36°F/72°F, respectively (CDM Smith 2016).

3. Site characteristics

Watersheds within the San Juan Mountains contain some 400 abandoned or inactive mines, where large- to small-scale mining operations occurred.

Surface Water

The Animas River watershed extends from the mountainous terrain above Silverton, CO, south into the San Juan River in Northern New Mexico. The three major tributaries that flow into the Animas River at Silverton include Cement Creek, Mineral Creek, and the Upper Animas River. Cement Creek and the Upper Animas River are the receiving waters for the Gold King Mine adit MIW discharge.

Site Geology and Hydrogeology

Years of mining and the installation of bulkheads has significantly influenced groundwater elevations within the BPMD Superfund Site. Historically, groundwater flowed along fractures and faults, with minimal leakage through bedrock, likely due to low primary permeability. With the advent of underground mining, bedrock groundwater that once followed natural fractures instead followed the new path of least resistance, the networks of tunnels in the underground mine workings. Thus, drainage and haulage tunnels form preferential flow paths for bedrock groundwater, leading to MIW formation when water and air interact with these mineralized source areas within the tunnels.

Bulkheads at many of the mine portals were used to regulate water levels during the operation of the Sunnyside mine through 1991. Between 1997 and 2004, bulkheads were installed to stop the uncontrolled flow of water from the mines, including three locations on the American Tunnel (drainage tunnel from the Sunnyside mine), the Mogul mine, and multiple locations throughout the Sunnyside mine. The bulkheads modified the bedrock hydrogeology and

resulted in changes in water flowing from adits. A bulkhead was installed at the Red and Bonita Mine in 2015, but the valve was left open until impacts to the surrounding groundwater elevations and discharging adits could be evaluated.

Gold King Mine Adits

Currently, there is no MIW discharge from the portal of the old adit due to portal collapse and blockage, possibly in multiple locations (CDRMS 2009; Weston 2016b); however, MIW is believed to be present within the old adit and could range between 3 and 5 feet of hydrostatic head (D&A 2016c; Weston 2016b). Based on the AutoCAD-based model; corresponding MIW volumes would range between 251,000 gallons and 3.6 million gallons, respectively.

Flows since August 2015 have been gradually increasing. MIW discharge from the new adit averages 540 gallons per minute (gpm), but could potentially increase to 1,000 gpm (D&A, 2016b as referenced in Weston 2016b) due to seasonal fluctuations. Current work plans are based on addressing MIW discharges up to 1,200 gpm (D&A, 2016c as referenced in Weston 2016b). There is a potential risk of uncontrolled discharge of MIW from upgradient mine workings within the new adit. This potential risk is driving the need for, and time sensitivity of, constructing the integrated MIW management infrastructure during the 2017 construction season. Using the existing AutoCAD-based model, it is estimated that as much as approximately 7.4 million gallons of MIW with a hydrostatic head of 62 feet could potentially be impounded by the flow control structure once it is installed.

4. Release or threatened release into the environment of a hazardous substance, or pollutant or contaminant

CERCLA hazardous substances from the list at 40 CFR 302.4 identified for this TCRA are beryllium, cadmium, copper, lead, manganese, silver, and zinc. The other COPECs identified from the draft Baseline Ecological Risk Assessment are pollutants and contaminants as defined in 40 CFR 300.5.

The source of hazardous substances, pollutants and contaminants is the discharging MIW from the Gold King Mine adit. MIW is water that is contaminated or influenced by mining-related activities. MIW can include both acid mine drainage (AMD) and acid rock drainage (ARD) or water that is not acidic. AMD is metal-bearing, acidic water discharged from underground mine workings through adits, tunnels, or shafts. ARD is a similar discharge of metal-bearing acidic water resulting from water seeping or flowing through and from acid-generating materials such as pyritic waste rock, tailings piles, or mineralized rock formations.

Acidic MIW forms when water and oxygen interact with sulfide-rich mine wastes, host rocks, or vein rocks. Sulfuric acid forms and can dissolve additional metals into the MIW. This MIW can discharge through adit portals or via seeps and springs in the groundwater and enter surface water. The Gold King Mine adit is one of many mines discharging MIW to local surface waters.

In the BPMD Superfund Site, the surface waters in the main stems of Cement Creek, Mineral Creek, and the Upper Animas River carry high loads of total and dissolved metals and high

acidity into the Animas River in the vicinity of Silverton even though substantial dilution with cleaner water occurs. Aquatic life in the affected waterways is exposed to the elevated levels of COPECs. In Cement Creek, current metal levels are high enough and pH levels low enough to cause Cement Creek to be essentially devoid of aquatic life.

The untreated Gold King Mine adit discharge exhibits a low pH and contains elevated concentrations of heavy metals, Fe and Al, including elevated concentrations of most of the surface water COPECs. The samples of untreated MIW were collected at the influent of the Gladstone Interim Water Treatment Plant (IWTP) and not at the adit because of the ongoing construction and portal rehabilitation activities at that time. Exhibit 1 provides ranges of concentrations and flow rates as summarized in the Engineering Evaluation/Cost Analysis for the BPMD – Gladstone IWTP.

Exhibit 1

Influent COPEC Concentrations and Flow Rate of MIW from the Gold King Mine Adit

COPECs and Flow Rate	Units	Values		
		Min	Max	Average
Flow Rate	gpm	300	961	540
Aluminum, Total	µg/L	13,000	75,000	26,957
Beryllium, Dissolved	µg/L	2.5	9.3	6.0
Cadmium, Dissolved	µg/L	35	170	66
Copper, Dissolved	µg/L	1,900	11,000	4,904
Iron, Total	µg/L	49,000	340,00	118,087
Lead, Dissolved	µg/L	0.3	35	12
Manganese, Dissolved	µg/L	1.2	30,000	23,391
pH	s.u.	3.3	3.4	3.3
Silver, Dissolved	µg/L	0.1	2.0	0.2
Zinc, Dissolved	µg/L	11,000	45,000	19,609

Note: Statistics of data from 10/19/2015 to 7/22/2016. For the statistical calculations, n=26 for flow; n=23 for Al, Be, Cd, Cu, Fe, Pb, Mn, Ag, and Zn; and n=3 for pH.
s.u. = standard units; µg/L = micrograms per liter

5. NPL status

EPA proposed the BPMD for addition to the NPL on April 7, 2016. A 68-day public comment period, during which EPA accepted comments from the public on the NPL proposal, closed on June 13, 2016. After carefully considering and responding to all comments in a responsiveness summary, EPA added the BPMD to the NPL on September 9, 2016.

6. Maps, pictures, and other graphic representations

Relevant figures and a photograph are included as attachments to the Action Memorandum. Figure 1 shows the BPMD Site location and Figures 2 through 5 provide visual understanding for the proposed discharge controls.

B. Other Actions to Date

1. Previous actions

Previous EPA response action activities conducted at the Gold King Mine adit are described below:

2014 and 2015: EPA investigations were performed around the Gold King Mine adit. (CDM Smith 2016).

August 2015: While EPA was conducting an investigation of the Gold King Mine adit, 3 million gallons of MIW were unexpectedly released from the mine. Upon release, concentrated MIW discharged into the North Fork of Cement Creek, below the mine, and ultimately into the Animas and San Juan Rivers (CDM Smith 2016). EPA immediately began implementation of an emergency removal action to address the release.

September through November 2015: Initial stabilization of the Gold King Mine Level 7 new adit was conducted.

October 2015: As part of the emergency removal action to the Gold King Mine adit release, the Gladstone IWTP was constructed to treat discharge from the Gold King Mine adit (CDM Smith 2016). The Gladstone IWTP has successfully treated the Gold King Mine adit discharge from October 2015 to the present.

April 2016: The BPMD Site was proposed for addition to the NPL (CDM Smith 2016).

June through October 2016: Additional stabilization of the Gold King Mine adit was completed (CDM Smith 2016).

September 2016: The BPMD Site was listed on the NPL and the listing became effective on October 11, 2016 (81 FR 62397, September 9, 2017).

November 14, 2016: The EE/CA was released to the public for a 30-day comment period.

January 12, 2017: Operation of the Gladstone IWTP was assumed from the Emergency Response to a Non-Time-Critical Removal Action

January 12, 2017: A final Pollution Report was signed closing out the Gold King Mine Release Emergency Response.

2. Current Actions

Since the Non-Time-Critical Removal Action Memorandum was signed on January 12, 2017, EPA activities at the Site have included continuous operation and management of the IWTP, maintenance of site access and facilities, and maintenance of the mine water conveyance system. With the listing of the BPMD Site on the NPL, EPA is reviewing other potential data needs to plan and implement remedial investigation (RI) activities at the BPMD Site.

C. State, Tribal, and Local Authorities' Role

1. State, Tribal and Local actions to date

State, Tribal, and local authorities have provided assistance to EPA by conducting independent and joint sampling activities and conducting independent and joint community outreach activities to help citizens and media stay informed of response activities. Additionally, they have provided notifications and assisted affected users regarding the status of the river system and established call centers for questions from the public. These partners also have provided Public Information Officers and other support activities. All of these activities have been and are conducted both jointly with and independently from the EPA response activities.

2. Potential for continued State, Tribal, and Local response

The State, Tribal, and local authorities referenced above have expressed their support of the stabilization efforts of the Gold King Mine portal and are expected to remain involved in future activities at the BMPD Site. State and local authorities do not have the resources or authority to conduct this removal action, and are involved in a consultation role only.

III. THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT AND STATUTORY AND REGULATORY AUTHORITIES

Conditions at the Site present a threat to public health and the environment, and meet the criteria for initiating a removal action under 40 CFR 300.415(b)(2) of the NCP.

Section 300.415(b)(2) of the NCP lists eight factors for EPA to consider in determining whether a removal action is appropriate. Specifically, EPA has determined that the following factors apply for the Gold King Mine Integrated Discharge Controls TCRA of the BPMD Site.

"(i) Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants;"

A human health risk assessment for the BPMD Site has not been conducted. However, there is a potential risk of uncontrolled discharge of MIW from upgradient mine workings within the new adit. The sudden release of a large volume of MIW would pose a threat to human receptors present in the immediate vicinity of the Gold King Mine Adit as well as adverse impacts to downstream well owners and recreational and business users of the river.

Aquatic receptors are being exposed to and adversely affected by heavy metals released from the Gold King Mine and other mine discharge waters at the BPMD Site. The available baseline ecological risk assessment (BERA) for the watershed (CDM Smith 2016) indicates adverse ecological risks to aquatic receptors. The COPECs in the surface water in the main stem of Cement Creek include pH, total Al, dissolved Be, dissolved Cd, dissolved Cu, total Fe, dissolved Pb, dissolved Mn, dissolved Ag and dissolved Zn (CDM Smith 2016). The chronic benchmarks for Al and Fe are based on the total metals due to the potential formation of iron and aluminum oxy-hydroxide precipitates; therefore, those COPECs are for total Al and total Fe. The sediment COPECs in Cement Creek include As, Be, Cu, Pb, Ag, and Zn.

It was found that the benthic macroinvertebrate population in the main stem of Cement Creek was impaired due to poor surface water and sediment quality as well as lack of habitat for macroinvertebrates. Furthermore, the water chemistry in Cement Creek is highly toxic and acutely lethal to fish, primarily due to low pH and high Al concentrations but also elevated Cd, Cu, and Zn. The 6-year study found that the water quality in Cement Creek would cause lethal stress to fish and would be acutely toxic to juvenile rainbow trout. Elevated total suspended solids is indicative of suspended mineral precipitates, which in an acidic aqueous environment can cause adverse impacts to aquatic receptors such as benthic macroinvertebrates through mineralogical coatings on their habitat.

Analysis of the hazard quotients suggests that the sediment poses moderate risk and that the surface water poses high risk to the benthic macroinvertebrate population. The fate and transport of contaminants and exposure pathways for wildlife receptors were not investigated for Cement Creek since the communities of fish and aquatic invertebrates in the creek were minimal or non-existent.

(ii) "Actual or potential contamination of drinking water supplies or sensitive ecosystems;"

As discussed above, risks to aquatic life from heavy metals in surface water is elevated for Cement Creek and the Animas River. The August 2015 release from the Gold King Mine resulted in a potential exposure to users of downstream waters from elevated concentrations of heavy metals identified in the affected rivers. As precautionary measures after the August 2015 release, municipal drinking water systems and agricultural users along the Animas and San Juan River systems downstream shut off water intakes until the spill plume had passed. The rivers were also closed to recreational use for a short period of time. A future uncontrolled release of the same or greater volume could result in similar threats to public health or welfare or the environment.

(v) "Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released;"

Concentrations and flow rates discharging from the adit have been observed to vary since the release, partially as a result of seasonal fluctuations in regional precipitation. Water discharged from the Gold King Mine adit may be of worse quality than prior to the release, resulting in an even higher mass of COPECs released to surface water and perhaps significantly worsening risks to aquatic receptors.

"The availability of other appropriate federal or state mechanisms to respond to the release;"

EPA is the lead agency at the BPMD Site. There are no other appropriate federal or state entities that have the funding resources to conduct the action in a timely manner.

"Other situations or factors that may pose threats to public health or welfare of the United States or the environment."

Potential activities elsewhere in the BPMD Site could affect the hydrodynamic conditions within the Gold King Mine, resulting in fluctuations or surges in flow of MIW discharge from the Gold King Mine adit.

IV. ENDANGERMENT DETERMINATION

Actual or threatened releases of hazardous substances, and pollutants and contaminants from the Gold King Mine, if not addressed by implementing the response action described in this Action Memorandum, may present an imminent and substantial endangerment to public health, or welfare, or the environment.

The endangerment determination is based on collaboration with EPA Region 8 staff toxicologists that led to the conclusions of the draft BERA which indicates adverse ecological risks to aquatic receptors in Cement Creek, which is a tributary to the Animas River.

V. EXEMPTION FROM STATUTORY LIMITS

A consistency exemption was requested as part of the January 12, 2017 Action Memorandum "because the proposed action (continuing water treatment) [would] exceed the $2 million ceiling" limitation as well as the 12-month performance limit. The basis for this exemption was based on the need to treat water at the on-site treatment plant over a three-year period to allow CERCLA investigations and engineering analyses to proceed regarding further response actions addressing water treatment for the Gold King Mine. While this TCRA does not exceed the 12-month or $2-million criteria, the original removal is on-going and continues to meet the previously approved exemption criteria.

VI. PROPOSED ACTIONS AND ESTIMATED COSTS

A. Proposed Actions

1. Proposed action description

The proposed actions consist of the installation of a flow control structure in the Gold King Mine Level 7 new adit, drilling a horizontal drain from the new adit to the Level 7 old adit, and constructing an earthen stabilization berm in front of the collapsed portal of the old adit. The primary goal of these proposed actions is to construct an integrated set of controls for MIW management within the Gold King Mine and any associated water surge resulting from a roof fall deeper in the mine that could cause a surge directly or create a dam that eventually breaches and fails.

Flow Control Structure

The flow control structure is a combination of reinforced concrete (applied as shotcrete between framing adit walls), stainless steel (framing members, access penetrations and rock anchors),

carbon steel (removable bulkhead panels that are isolated from the mine water), high density polyethylene (isolation between mine water and removable bulkhead panels) and Viton synthetic rubber (O-ring gasket material) (see Figure 2). The flow control structure will be installed approximately 70 feet inside the tunnel from the portal (see Figure 3).

The flow control structure will achieve the following primary objectives.

- Prevent an uncontrolled surge of mine waste from exiting the portal and entering Cement Creek.
- Limit the flows exiting the portal to levels that can be treated by existing and potentially future on-site waste treatment systems.
- Provide safety for personnel working below the portal or accessing the adit in the future.
- Provide machinery access through the flow control structure for future work.

The main features include:

- **Equipment Access** – a nominal 10-ft x 10-ft access is provided for movement of large equipment and materials through the portal. The access is water tight and designed to withstand hydrostatic pressures up to 100 feet of head. In the event of collapse and movement of large quantities of mine waste to the portal, the bulkhead panels can be individually removed (from top to bottom) to allow removal of materials without the release of excessive mine waste.

- **Personnel Access** – A water tight flanged portal (24 in. wide by 48 in. high) is provided for personnel access for maintenance and inspection. This portal can be readily removed or installed without the use of heavy equipment. An upper 12-in. diameter port is provided above the equipment access for ventilation of the confined space.

- **Drainage Control Valve** – A 12-in. diameter stainless steel knife gate would be used to control the flow of MIW from the adit. Under current conditions, the valve would be fully opened and produce approximately 500 gpm. If mine drainage increases, the valve would be partially closed to release at the capacity of the downstream treatment system. As currently envisioned, the valve would be manually operated. It is also simple to outfit the valve with an automatic actuator that will control flows based on upstream water levels.

- **Instrumentation** – A sonic level sensor would be mounted above the drainage control valve on the upstream face of the flow control structure. The sonic level sensor will monitor the water level on the upstream side of flow control structure on a continuous basis. This water level can be used to calculate the flow exiting the adit. In the event that a large internal release of water occurs and the sonic level sensor is flooded, a pressure transducer can be mounted within the tunnel to read water pressure. This sensor would monitor pressure on a continuous basis. The information from the sensors can be recorded locally and read locally or uploaded via telemetry for performance monitoring.

- **Materials Compatibility** – The materials of construction proposed were selected in consideration of the corrosive environment of the mine drainage and the corrosive airspace

within the adit. The materials and instruments were also selected to be readily available and able to be procured and constructed immediately.

- **Cold Weather Conditions** – This region of Colorado can be expected to experience extreme cold (at of below – 30 degrees F) and heavy snow falls. The cold conditions may make it necessary to insulate or bury the discharge pipe. Heavy snow will make access at times impossible. This will make on-site recording of data essential along with battery backup for instruments in the event of power failure.

Horizontal Well

The Level 7 old adit is collapsed at the portal and likely at other locations. One collapse is visible as a surface feature (sinkhole) from 60 to 90 feet in from the existing portal pipe (Figure 4). This collapse likely impounds MIW. Based on DRMS photographs taken between 2004 and 2011, the historic adit only dribbled small quantities of water while the new adit ran at tens or hundreds of gpm.

As shown in Figure 3, the old and new adits are connected at three intersections of the mine workings, 12, 17, and 19 feet higher than the portal. As long as the new adit is open and draining, there should be little head (less than 12 ft) and limited flow from the historic adit as long as the connections are open. If the connections are blocked, trapped water may be at a higher head (perhaps 20-30 feet). Surges would take the path of least resistance through the new adit. However, after construction/installation of the flow control structure, the new adit is secure but the structural capability of the old adit to withstand increased pressures is questionable if water rises above a certain level. If water backs up behind the flow control structure intentionally (valve closed or throttled) or unintentionally (surge or roof collapse dam deeper in the mine), water will potentially also back up behind the historic portal if accumulation continues beyond a point 800 feet in-by of the flow-control structure (12 foot head at the flow control structure and historic adit portal).

Therefore, the construction of a horizontal well between the new and old adits will allow MIW accumulation within the old adit to drain through the horizontal well into the new adit portal. Both the flow control structure and the horizontal drain will be connected to the existing MIW drainage system for treatment of the MIW at the Gladstone interim water treatment plant.

Construction of the horizontal well will consist of drilling through 170 feet of competent bedrock from the Level 7 new adit at an angle to intersect the old adit approximately 120 feet in from the portal (see Figures 3 and 4). This should put it past the known and suspected roof falls near the old portal and intercept the mine pool directly upstream of the portal (i.e. that head of water that would have to be resisted by the current portal conditions). During drilling, blow off prevention will be used to control the unknown mine pool level. Once the hole is drilled, a valve will be installed and piping attached to direct flows into the sump and treatment pipe system. Once the mine pool is drained, a remote camera will be sent into the pipe to document conditions in the old adit at that location. After the initial draining, this pipe will limit pressures in the old adit even if the flow control structure or new adit became plugged.

Stability Berm

The purpose of the stability berm is to provide an additional factor of safety to reduce the risk of a blow out from the old adit. The stability berm will be constructed of nearby available soils and rock placed in front of the collapsed portal of the old adit (see Figure 5). This will include the following components.

- Laying an approximately 2-foot thick bed of 1.5-inch coarse, washed aggregate,
- Installing a new 36-inch HDPE extension pipe and connecting it to the existing 36-inch corrugated drain pipe,
- Installing two, new 8-inch perforated polyvinyl chloride (PVC) pipes located on either side of the new 36-inch HDPE extension pipe, and
- Emplacing the earthen berm, graded into the hillside at the portal entrance at a height of approximately 15 feet above ground surface and with 3:1 (horizontal: vertical) side slopes, as is common industry practice.

2. Contribution to remedial performance

This effort will, to the extent practical, contribute to any future remedial effort at the Site. However, no further federal action is anticipated at this time.

3. Engineering Evaluation/Cost Analysis

An EE/CA is not required for a time-critical removal action.

4. ARARs (Applicable or Relevant and Appropriate Requirements)

Removal actions conducted under CERCLA are required, to the extent practicable considering the exigencies of the situation, to attain ARARs. In determining whether compliance with an ARAR is practicable, the lead agency may consider appropriate factors, including the urgency of the situation and the scope of the removal action to be conducted. Based on the scope of the proposed actions, no ARARs have been identified for this TCRA.

5. Project Schedule

Consultation regarding the Gold King Mine Integrated Discharge Controls was initiated with EPA Headquarters in April 2017. Work cannot begin until approval to proceed is received from Headquarters and contract award(s) is made. Both actions are expected to occur in July 2017. Schedules for all three activities (flow control structure, horizontal well, and the stability berm) are dependent on contractor availability as proposed by bidders. However, completion is expected by the end of the field season in October 2017.

B. Estimated Costs

	Estimated Costs[1]
ERRS contractor	$ 495,000
SUBTOTAL	$ 495,000
Contingency costs (20% of subtotal)	$ 99,000
Estimated Removal Project Ceiling	**$ 594,000**
Previous BPMD Total Project Ceiling (1/12/17)[2]	$ 5,489,000
TOTAL BPMD REMOVAL ACTIONS' CEILING	$ 6,083,000

[1] EPA direct and indirect costs, although cost recoverable, do not count toward the Removal Ceiling for this removal action. Liable parties may be held financially responsible for costs incurred by the EPA as set forth in Section 107 of CERCLA.

[2] For more information, see Action Memorandum for the Gladstone Interim Water Treatment Plant for Gold King Mine Discharge at the Bonita Peak Mining District NPL Site, 1/12/17.

VII. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

A delay in action or no action at this Site would increase the actual or potential threats to the public health and/or the environment.

VIII. OUTSTANDING POLICY ISSUES

None.

IX. ENFORCEMENT

A separate Enforcement Addendum has been prepared providing a confidential summary of current and potential future enforcement activities.

X. RECOMMENDATION

This decision document represents the selected removal action for the Gold King Mine Integrated Discharge Controls within the BMPD Superfund Site in San Juan County, Colorado, developed in accordance with CERCLA as amended, and is not inconsistent with the NCP. This decision is based on the administrative record for the BMPD Superfund Site.

Conditions at the site meet the NCP Section 300.415(b) criteria for a removal action and continue to meet the CERCLA 104(c) consistency exemptions from the 12-month and $2 million exemptions. The total project ceiling (excluding past removal actions), if approved, will be $594,000; this amount will be funded from the Regional removal allowance.

APPROVE

Betsy Smidinger _____ 7/10/17

Betsy Smidinger
Assistant Regional Administrator
Office of Ecosystems Protection and Remediation

Date

DISAPPROVE

_____ _____

Betsy Smidinger
Assistant Regional Administrator
Office of Ecosystems Protection and Remediation

Date

ATTACHMENTS

Figure 1 – Bonita Peak Mining District Superfund Site
Figure 2 – Flow Control Structure
Figure 3 – Gold King Mine Workings
Figure 4 – Old and New Level 7 Adits
Figure 5 – Historic Portal Stability Berm

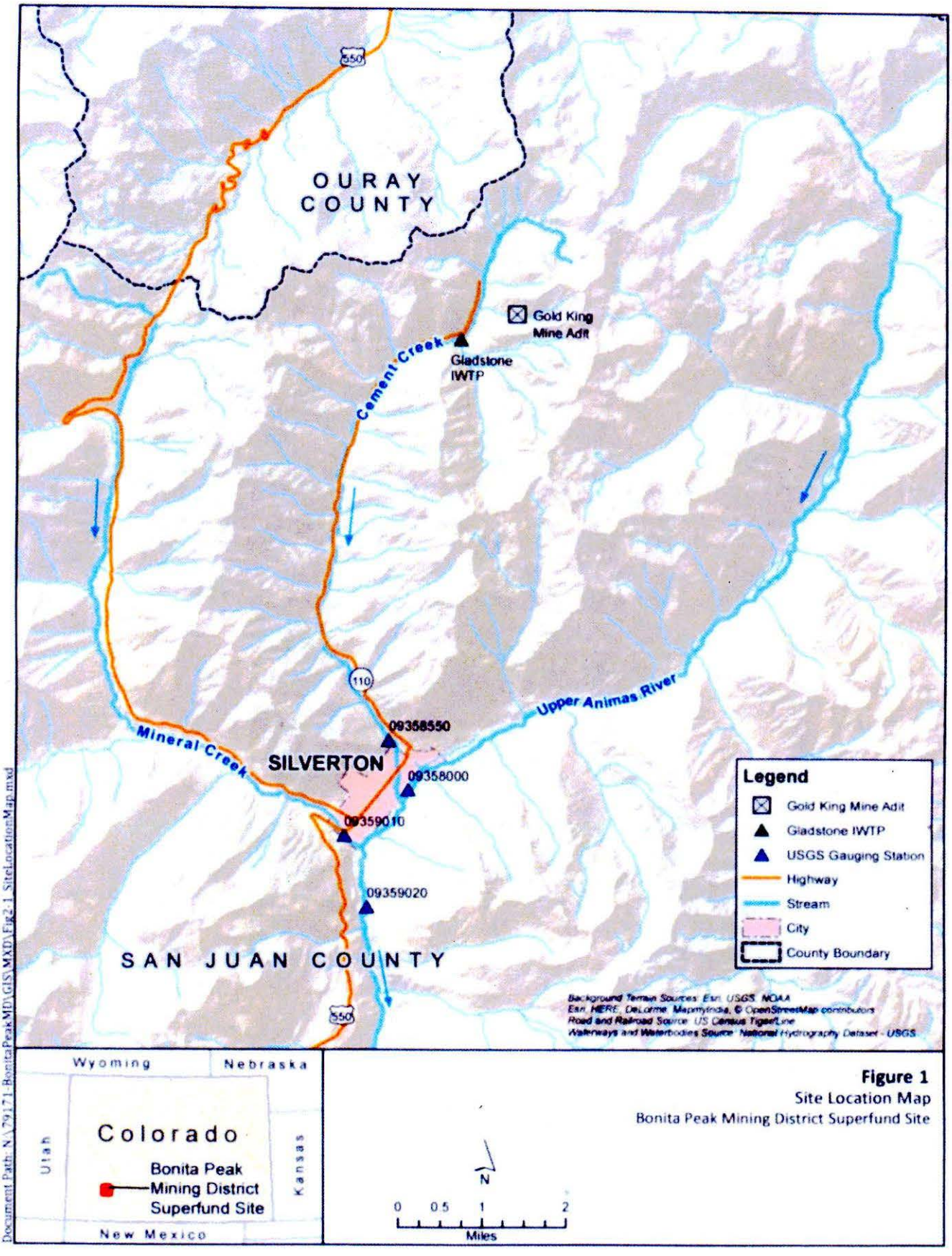
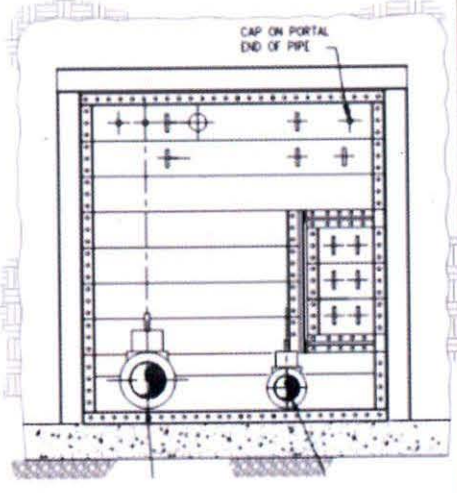


Figure 1
Site Location Map
Bonita Peak Mining District Superfund Site



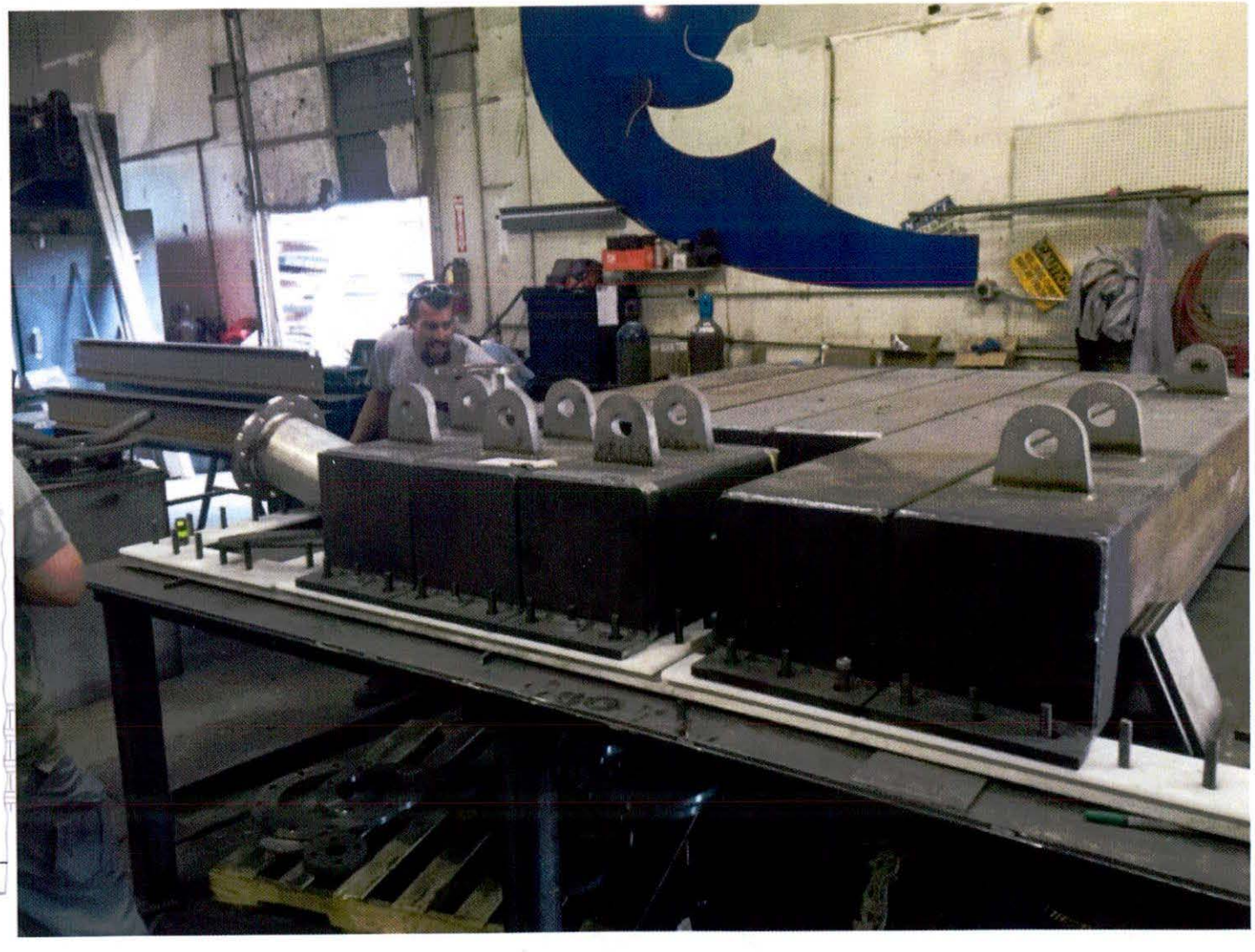
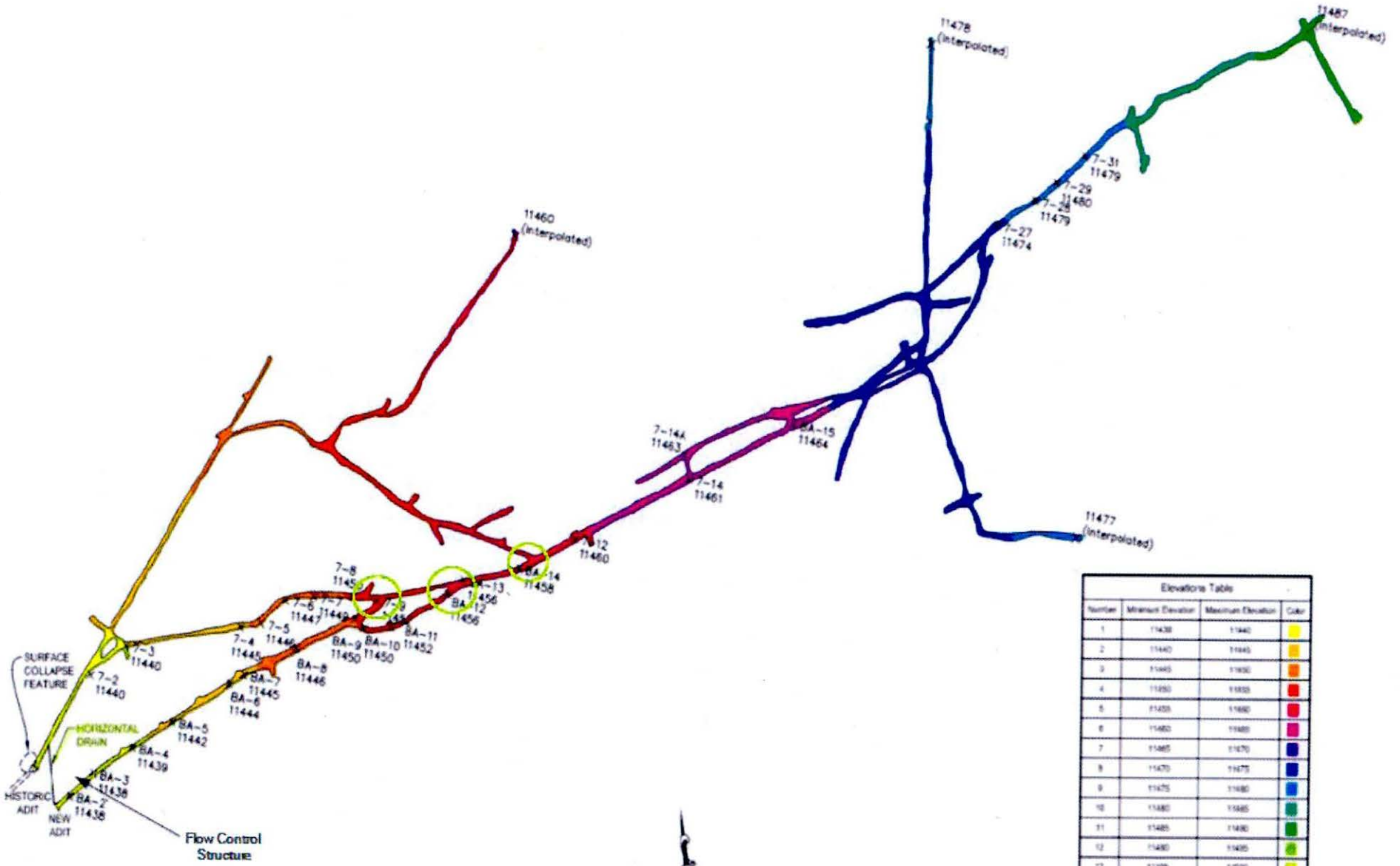


Figure 2
Flow Control Structure



LEGEND:

X BA-2 1985-86 SURVEY POINT
11438 ELEVATION ADJUSTED TO CURRENT BENCHMARK

SCALE IN FEET

NOTES:

1. D&A C VIL 3D CAD MODEL BASED ON DRMS 2D CAD FILE, GERBER MINES GOLD KING PROSPECT GEOLOGIC MAP, AND 1985-86 SURVEY NOTES.
2. ALL ELEVATIONS ADJUSTED TO GOFF ENGINEERING 8/28/2015 BENCHMARK. US STATE PLANE 1983, COLORADO SOUTH 0503, NAD 1983, GEOID 12A SCALED TO GROUND ABOUT GPCS, GROUND SCALE FACTOR 1.0005975426

Elevations Table

Number	Minimum Elevation	Maximum Elevation	Color
1	11438	11440	
2	11440	11445	
3	11445	11450	
4	11450	11455	
5	11455	11460	
6	11460	11465	
7	11465	11470	
8	11470	11475	
9	11475	11480	
10	11480	11485	
11	11485	11490	
12	11490	11495	
13	11495	11500	

JOB NO. (251.003.20)

Gold King Mine

Level No. 7 - Floor Elevation

DEERE & AULT CONSULTANTS, INC.

DATE: 4/22/16 SCALE: AS NOTED

Figure 3
Gold King Mine
Workings

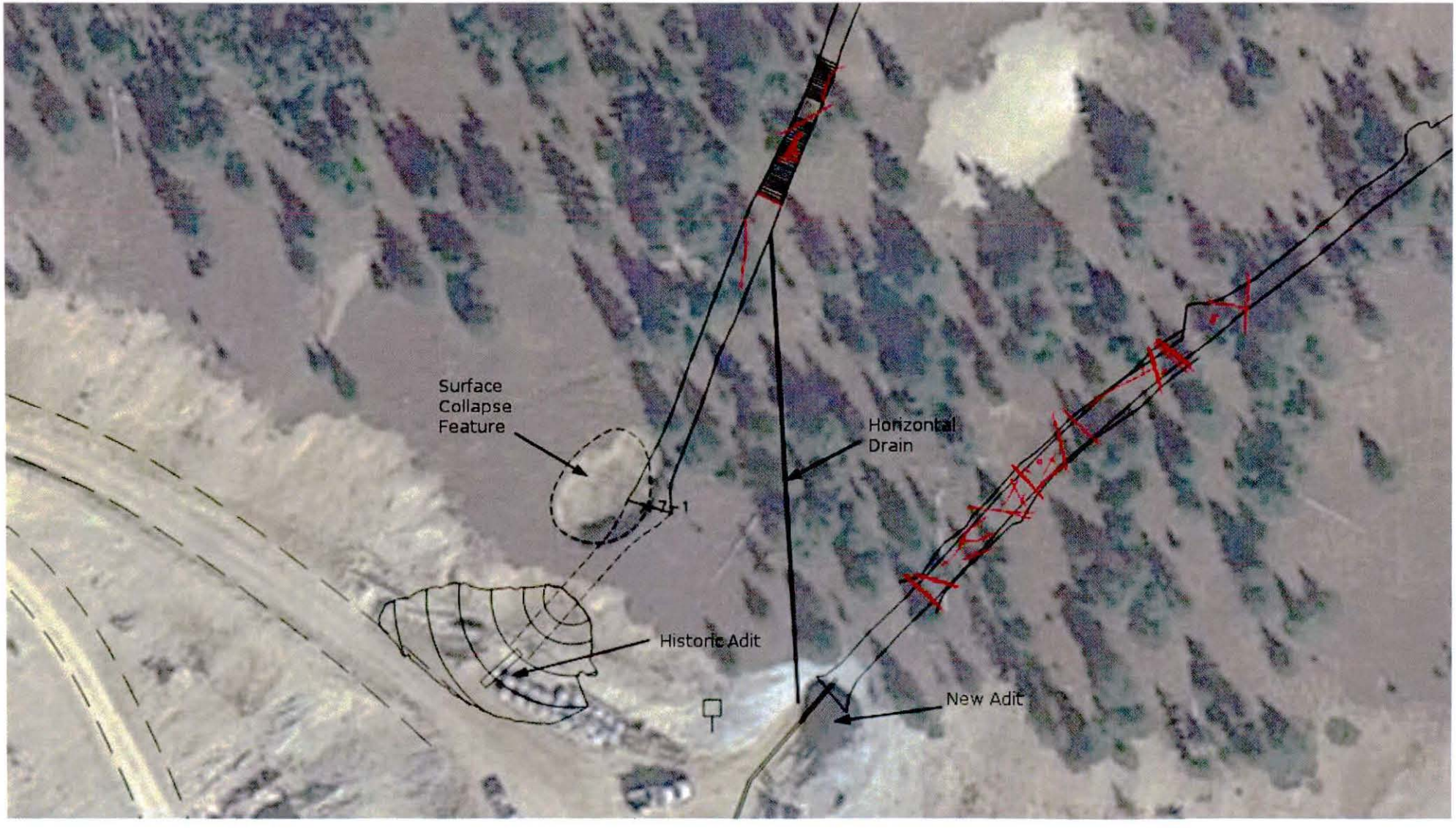


Figure 4
Old and New
Level 7 Adits

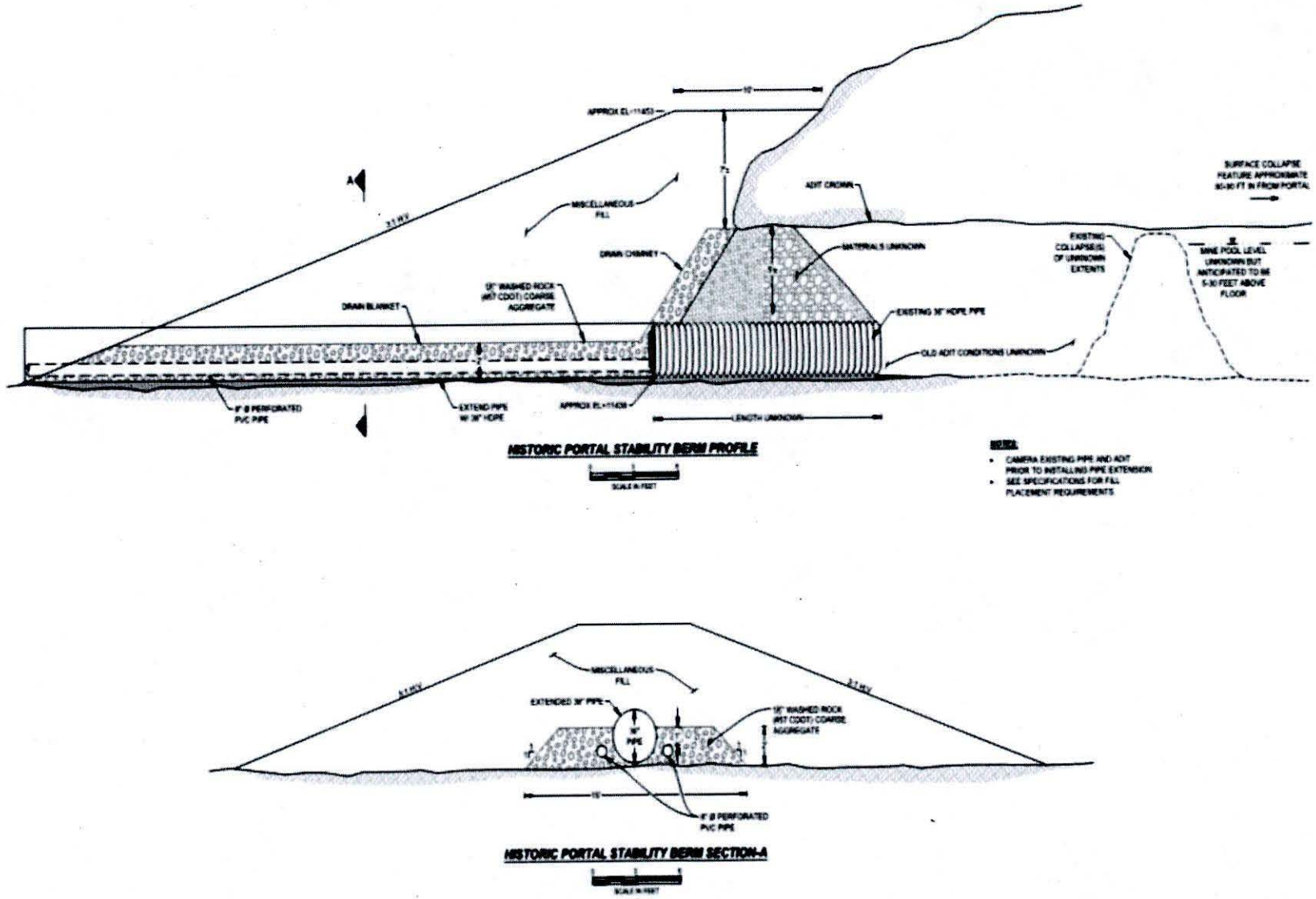


Figure 5
Historic Portal Stability Berm